Image credit: NASA

National Aeronautics and Space Administration

Electrical and Electronics

Rapid and Verified Crimping for Critical Wiring Needs

A collection of crimping innovations to precisely crimp and verify mission critical connections

NASA's Langley Research Center has created a collection of innovations for rapid, precise, and verified crimps. Wiring crimp failures can be a threat to safety and may lead to a loss of critical functions in high risk applications, such as aerospace. In addition to the safety concerns, diagnosing and repairing poor crimp connections can be costly. NASA Langley's crimping innovations increase quality and reduce risk by using ultrasound to provide real-time, nondestructive verification of wire-crimp integrity while the crimp is being formed. This technology can be applied to electro-mechanical crimping machines, where the appropriate force required to form a crimped connection is determined in real-time. Such an application prevents over or under crimping and prevents excessive tool wear. Langley has also created a means and method to calibrate and verify the mechanical and electrical settings for an ultrasonically enhanced crimp tool.

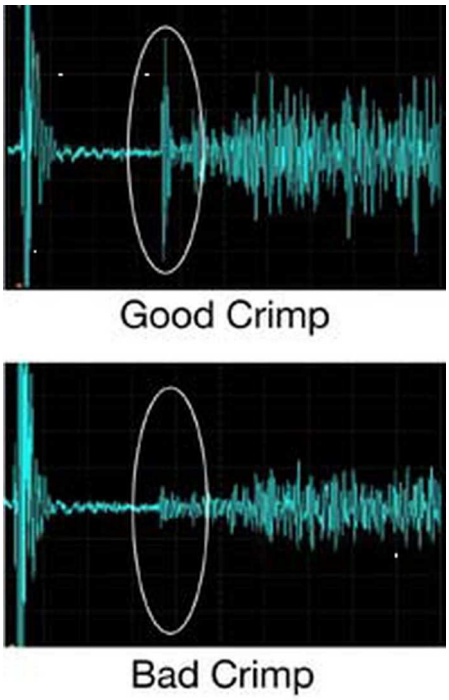
BENEFITS

- Improved quality control: Enables direct and practical testing of all crimp connections
- Improved safety: Allows direct testing of all crimp connections as they are made
- Reduced costs: Lowers risk of failed crimp connections that are costly to replace
- Real-time confirmation of crimp integrity

technology solution

THE TECHNOLOGY

The crimping innovations are based on traditional ultrasonic nondestructive evaluation methods. The quality of the contact between the connector and wire is determined by sending an acoustic wave through the crimp assembly. As the applied pressure increases and the crimp terminal deforms around the wire, the ultrasonic signature passing through the crimp is altered. The system analyzes the changes in the signal, including the amplitude and frequency content, as an indication of the quality of both the electrical and mechanical connection between the wire and terminal. Various crimp quality issues such as undercrimping, missing wire strands, incomplete wire insertion, partial insulation removal, and incorrect wire gauge have been tested using this technique, and results show that the instrumented crimp tool consistently discriminates between good and poor crimps for all of these potential quality issues. This information can be used to provide a pass or fail indication for instant verification of the crimp quality and to give a better prediction for the service life of the crimp.



Ultrasonic response of a crimped connector

APPLICATIONS

The technology has several potential applications:

- This technology can improve safety andreduce costs related to installing and/ or overhauling crimp/wire connections in industries with critical wire terminations, such as:

  -- Marine
  -- Automotive
  -- Industrial plants
  -- Nuclear power plants
  -- Medical devices

PUBLICATIONS

Patent No: 7,181,942; 8,671,551; 8,490,463; 8,875,580; 9,003,645

Patent Pending

More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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